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Individual and group-level job resources and their relationships with individual work engagement

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Abstract: Objectives: This study adds a multilevel perspective to the well-researched individual-level relationship between job resources and work engagement. In addition, we explored whether individual job resources cluster within work groups because of a shared psychosocial environment and investigated whether a resource-rich psychosocial work group environment is beneficial for employee engagement over and above the beneficial effect of individual job resources and independent of their variability within groups. **Methods:** Data of 1,219 employees nested in 103 work groups were obtained from a baseline employee survey of a large stress management intervention project implemented in six medium and large-sized organizations in diverse sectors. A variety of important job resources were assessed and grouped to an overall job resource factor with three subfactors (manager behavior, peer behavior, and task-related resources). Data were analyzed using multilevel random coefficient modeling. **Results:** The results indicated that job resources cluster within work groups and can be aggregated to a group-level job resources construct. However, a resource-rich environment, indicated by high group-level job resources, did not additionally benefit employee work engagement but on the contrary, was negatively related to it. **Conclusions:** On the basis of this unexpected result, replication studies are encouraged and suggestions for future studies on possible underlying within-group processes are discussed. The study supports the presumed value of integrating work group as a relevant psychosocial environment into the motivational process and indicates a need to further investigate emergent processes involved in aggregation procedures across levels.
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Key words: Group-level job resources, Job demands-resources model, Multilevel analysis, Work engagement, Emergent processes

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In the field of occupational health psychology, a broad body of empirical research has shown that individual job resources enhance employee work engagement[1-3]. Most research, however, has been conducted at an individual level of analysis, neglecting the likely influence of the nested structure of the organizational setting. Employees are embedded in organizations with their own structures, such as departments and teams[4], and thus share a common psychosocial environment, which is considered to differ among organizational groups. The work group represents a proximate psychosocial environment that potentially influences employee perceptions and behaviors[5]. Thus far, the following remain unclear: first, whether and to what extent job resources cluster within work groups and second, whether or not it is additionally beneficial for employees to be part of a resource-rich psychosocial work group environment. This study explores these two gaps in the literature by adding a multilevel perspective to the motivational process specified in the Job Demands-Resources (JD-R) model[6].

Job resources and their relationship with work engagement

This study focused on the motivational process proposed by the JD-R model, whereby individual job resources exert a motivational potential and lead to high work engagement[2]. Job resources refer to those physical, psychological, social, or organizational aspects of the job that may either (1) be functional in achieving work goals; (2) reduce job demands and associated physiological and psychological costs; or (3) stimulate personal growth,

learning, and development[7]. Work engagement is defined as a positive, fulfilling, work-related state of mind that is characterized by vigor (i.e., high levels of energy and mental resilience while working), dedication (i.e., sense of significance, enthusiasm, inspiration, and challenge), and absorption (i.e., being fully involved and happily engrossed in one's work)[8,9]. The positive effect of job resources on work engagement has been supported in cross-sectional as well as longitudinal studies[1,3,10-12]. The relationships between job resources and work engagement, however, cannot be generalized to apply to cross-level relationships to answer the present research question because these studies were conducted at an individual level of analysis.

Aggregated group-level job resources

It can be assumed that job resources are shared at the level of the immediate work group to a certain extent. Accordingly, one can expect some minimal agreement on the perceptions of job resources within groups because group members are exposed to shared psychosocial context factors or group characteristics, such as similar work tasks, common supervisors and colleagues, and a group climate[13]. Likewise, it can be assumed that work groups significantly differ with respect to their mean levels of job resources. In conceptualizing the construct of group-level job resources, the present study applied an additive composition model[14], also referred to as a summary index model[15], and aggregated individual-level job resources to the work group level. In doing so, it was assumed that the aggregated group-level job resource construct represents a proxy for a resource-rich psychosocial work group environment. The following hypotheses were formulated:

Hypothesis 1a: Group-level job resources emerge as a contextual resources construct from aggregated individual perceptions of job resources.

Hypothesis 1b: Group-level job resources subfactors, i.e., group-level manager behavior, group-level peer behavior, group-level task-related resources, emerge as contextual resource constructs from aggregated individual perceptions of job resource subfactors.

Cross-level relationship between group-level job resources and individual work engagement

As research has shown, the social context influences individual group members[16]. Previous research on the relationships between psychosocial work characteristics at group level and individual outcomes such as well-being, however, is scarce. Gavin and Hofmann aggregated individual perceptions of task significance, a core job resource, to the group level and found evidence for an additional contextual influence of group-level task significance on individual-level hostility after controlling for individual-level task significance[13]. With regard to the positive side of work characteristics and employee health and well-being, referred to as the motivational process in the JD-R model, there is one study that examined the clustering of group-level job resources and their relationships with individual well-being in terms of work engagement. That study showed that team-level support from co-workers and supervisors was positively related to individual work engagement. However, this effect was not controlled for the individual-level support from co-workers and supervisors[17]. Thus, that study does not indicate whether team-level support is helpful for work engagement over and above individual support. What we know so far is that perceiving high individual job resources is beneficial for feeling engaged in one's job. However, what we do not know is whether it is additionally beneficial for employees' work engagement if they work in a resource-rich psychosocial work group environment, i.e., where their co-workers experience high job resources on average. On the basis of the limited existing evidence summarized above, we expected that a resource-rich work group environment would have an additionally motivation-enhancing effect on one's work engagement and thus formulated the following hypotheses:

Hypothesis 2a: Group-level job resources have an additive positive effect on individual work engagement over and above that of individual-level job resources.

Hypothesis 2b: Group-level job resource subfactors, i.e., group-level manager behavior, group-level peer behavior, group-level task-related resources, have an additive positive effect on individual work engagement over and above that of individual-level job resource subfactors.

When analyzing the effects of group-level job resources, it is important to control for the effects of variability of job resources within groups, which has been shown in a study on leadership climate[18]. Variability within groups can suppress irrelevant variance in group-level job resources and thus ensures an unbiased estimation of the effect of group-level job resources on individual engagement[19]. Not only a direct effect of variability within groups on engagement but also an interaction effect of variability and group-level job resources is possible and should therefore be controlled for in the analyses to facilitate an unbiased estimation of the cross-level effect[19]. These methodological considerations led to the formulation of the following hypothesis:

Hypothesis 2c: The cross-level relationships assumed in Hypotheses 2a and 2b remain significant even when a possible competing effect of and interaction with the variability of job resources within groups is controlled for.

Method

Participants

This study employed data collected in the baseline employee survey of a large stress-management intervention project (see acknowledgments). The study sample con-

sisted of 1,219 employees without supervisory function from six medium- and large-sized Swiss organizations in diverse sectors (three industrial production companies, one food processing company, one public administration service, and one hospital). These employees were nested in 103 work groups. The average group size was 11.5 employees (range: 2-44). The sample consisted of slightly more male than female employees (females: 47.7%), the mean age of our respondents was 38 years (*SD*=11), the mean organizational tenure was 7.7 years (*SD*=8.7), and the mean job tenure was 4.8 years (*SD*=6.2). Approximately 74% of the participants worked full time.

Measures

All variables of this study are indicated in Table 1. The independent variable at individual level, i.e., *individual job resources*, was assessed using eight scales, which were clustered into three subfactors of job resources: *manager behavior*, *peer behavior*, and *task-related resources*. The scales constituting each factor are listed in Table 1. These subfactors and also the total individual job resources factor were previously used in two other studies[20,21]. The independent variable at work group level, i.e., *group-level job resources*, was assessed by calculating the means of individual job resources of all employees who participated from each work group. This was accordingly performed for each subfactor and the overall job resources factor, resulting in *group-level manager behavior*, *group-level peer behavior*, *group-level task-related resources*, and the overall group-level job resources construct. Higher scores indicate more resources on average. In addition to the variable of interest, i.e., group-level job resources, we controlled for their variability within groups to ensure that the effect of group-level job resources on engagement is not biased by variability within groups[19]. Applying a dispersion composition model[14], group-level job resources variability was assessed by calculating the standard deviation of individual job resources scores of all employees who participated from each work group. Again, this was performed for each job resources subfactor and the overall job resources factor. Higher scores represent higher variability in job resources within groups. The dependent variable of this study, i.e., *work engagement*, was assessed at an individual level (see Table 1). In the analyses, we controlled for a number of *covariates* both at individual and group levels (see Table 1). In addition to sociodemographic variables, we controlled for job demands, thus following a plea for a better understanding of the motivational process of the JD-R framework[9].

Data analyses

To reduce the data set to a smaller subset of variables, we calculated factor scores (regression method) for the three job resources subfactors of manager behavior, peer behavior, and task-related resources in the first step and for the overall job resources factor in the second step. The same factors were used in two other studies[20,21] and were supported using exploratory and confirmatory factor analyses (results can be obtained from the corresponding author).

To test the hypotheses, we employed multilevel random coefficient modeling using the nlme package in R[22,23]. Model fits were estimated by the restricted maximum likelihood (REML) method. We assumed minimal within-group agreement of individual ratings and significant differences across work groups in the mean level of job resources reflecting the shared psychosocial work group environment (Hypotheses 1a and 1b). We assessed the intra-class correlation coefficient ICC(1) to identify the proportion of the variance explained by the grouping structure of the data. An ICC(1) value of 1%, 10%, or 25% indicates a small, medium, or large effect of the group context, respectively[24]. Further, we calculated ICC(2), which indicates the reliability of the group mean[25] and the James, Demaree and Wolf[26] mean $r_{WG(J)}$ agreement index that indicates within-group agreement in the corresponding measures[15].

For the multilevel analyses, all variables with no meaningful zero point were centered according to the recommendations of Enders and Tofighi[27]. To test for the presumed cross-level main effect of group-level job resources (Hypotheses 2a and 2b), we estimated, first, a model with no explanatory variables (intercept-only model), which served as a benchmark value of deviance for comparison with competing models (Step 1). Second, we added all group mean-centered individual-level predictors and covariates fixed (Step 2). This means that relationships between individual-level predictors and work engagement were not allowed to vary between groups. Covariates with no explanatory value were then omitted from the model before the next step. In the third step, the group level covariate and a group-level job resources factor were included (Step 3). In this step, individual and group-level job resources were grand mean centered to detect an additional explanatory value of group-level job resources on individual engagement[27]. Again, covariates with no explanatory value were omitted from the model before the next step. Following the recommended procedure of Cole et al.[19] to ensure unbiased estimates of relationships with group-level constructs, two more steps in model building were performed. This is particularly indicated in cases where ICC(2) and $r_{WG(J)}$ estimates indicate substantive variability within groups[19]. Thus, fourth, we included the corresponding group-level job resources variability variable to control for the varying dispersion of job resources at group level (Step 4). In a final step, we examined a possible interaction effect of group-level job resources and their variability within groups to examine if

Table 1. Study variables

Scale	Description	Response scale	Item number (Sample item)	α[a]
Independent variables				
Individual level				
Manager behavior:				
Interpersonal justice[39]	Interpersonal treatment by supervisors during decision-making processes	1=to a small extent to 5=to a large extent	4 (To what extent has he/she treated you with respect?)	.81
Employee-oriented supervisor behavior[40]	Supervisors are easily accessible to their employees, behave in a respectful and fair manner, and give direct feedback	1=almost never/not at all true to 5=almost always/fully true	5 (The line manager lets one know how well a job has been performed)	.82
Supervisor support[41]	Social support from direct supervisor	1=not at all to 5=a lot	1 (How much can you rely on your direct supervisor in difficult situations at work?)	–
Appreciation from supervisor[42]	Satisfaction with appreciation from direct supervisor	1=extremely dissatisfied to 7=extremely satisfied	1 (Overall, how satisfied are you with your line manager's appreciation of you as a person?)	–
Peer behavior:				
Peer support[41]	Social support from work colleagues	1=not at all to 5=a lot	2 (How much can you rely on close colleagues in difficult situations at work?)	.71
Appreciation from colleagues[42]	Satisfaction with appreciation from work colleagues	1=extremely dissatisfied to 7=extremely satisfied	1 (Overall, how satisfied are you with your colleagues' appreciation of you as a person?)	–
Task-related resources:				
Job control[43]	Having control over when and how to do tasks involved in the job	1=very little/not at all to 5=very much	6 (Can you organize your workday autonomously?)	.86
Task identity[40]	Doing a complete task, from planning to a visible outcome	1=almost never/not at all true to 5=almost always/fully true	1 (In my job, one can produce something or perform an assignment from A to Z)	
Group-level				
Group-level manager behavior, group-level peer behavior, and group-level task-related resources	Same scales as at individual level (see above) but aggregated at the group level (mean level)	–	–	–
Group-level job resources (*manager behavior/peer behavior/ task-related resources*) variability	Standard deviation of the respective job resources within groups	–	–	–
Dependent variable				
Work engagement[44]	Positive, fulfilling, work-related state of mind, characterized by vigor, dedication, and absorption	0=never to 6=always/ every day	9 (I feel happy when I am working intensely)	.94

Note. [a]Cronbach's α, [b]Sex is coded as 0=*male*, 1=*female*, [c]Education is scored on a 5-point likert-type scale from 1=*primary school* to 5=*university degree*.

(continued)

Table 1. Study variables

Scale	Description	Response scale	Item number (Sample item)	α[a]
Covariates				
Individual level				
Sociodemographics:				
Age, Sex[b], Education[c], Job tenure	–	–	–	–
Job demands:				
Uncertainty at work[45)]	Unclear or ambiguous instructions and absence of sufficient information to make decisions	1=very rarely/never to 5=very often/constantly (three items); 1=from nobody to 5=from more than three persons (one item)	4 (How often do you receive contradictory instructions from different supervisors?)	.74
Qualitative overload[40)]	Tasks are too complicated and difficult	1=almost never/not at all true to 5=almost always/fully true	3 (It happens that work is too difficult for oneself)	.80
Time pressure[45)]	Having to do tasks in less time than is available	1=very rarely/never to 5=very often/constantly	4 (At work, how often is a rapid pace of work required?)	.83
Work interruption[45)]	Having to interrupt work because of external circumstances	1=very rarely/never to 5=very often/constantly	4 (How often does it occur that you cannot work on something in peace because something else always interrupts?)	.80
Group-level				
Group size	Number of employees in the work groups	–	–	–

Note. [a]Cronbach's α, [b]Sex is coded as 0=*male*, 1=*female*, [c]Education is scored on a 5-point likert-type scale from 1=*primary school* to 5=*university degree*.

the hypothesized cross-level effect of group-level job resources is independent of the level of variability of job resources within groups (Step 5). All group level variables were centered at the grand mean[27)].

Results

Table 2 shows the means, standard deviations, and bivariate correlations of the study variables at individual level, and Table 3 shows those of the study variables at group level. Results of an analysis of variance of work engagement with work groups as the grouping variable indicated significant between-group differences, $F(102, 1079)= 1.45$, $p < .01$. ICC(1) shows that 4% of the variance in individual-level work engagement depended on group membership, representing a small effect of the grouping structure. The data thus indicates that a multilevel structure is confirmed, and multilevel analyses are indicated.

Total job resources factor (H1a)

The first hypothesis stated that group-level job resources emerge as a contextual resources construct from aggregated individual perceptions of job resources. Results of an analysis of variance of job resources with work groups as the grouping variable indicated significant between-group differences [F (102, 990)= 1.78, $p < .001$]. The calculated ICC(1) shows that 7% of the variance in individual-level job resources depended on group membership, representing a small to medium effect of the grouping structure. ICC(2) was equal to .44, indicating a moderate reliability of the group means. Finally, the mean within-group agreement coefficient $r_{WG(J)}$ was .97 (range =.91-.99), indicating very strong agreement within groups[24)]. Thus, *Hypothesis 1a* was supported.

Three job resources subfactors (H1b)

The same analyses were conducted for the three subfactors of job resources. Group differences were significant for all subfactors with ICC(1) values indicating that 5%, 8%, and 19% of the variance in manager behavior, peer behavior, and task-related resources, respectively, depended on group membership. This represents a small to medium effect of the grouping structure in manager and peer behavior and a medium to large effect in task-related resources. The corresponding ICC(2) values were

Table 2. Means, standard deviations, and bivariate correlations of study variables at individual level (N=1,219)

Variables	*M*	*SD*	1	2	3	4	5	6	7
Individual-level									
1. Sex[a]			–						
2. Age	37.96	11.19	–.02	–					
3. Job demands	.09	.90	.00	.01	–				
4. JR-total	.28	.88	–.02	–.04	–.33***	–			
5. JR-manager	.13	.96	–.02	–.09**	–.32***	.77***	–		
6. JR-peer	.16	.91	.01	–.07*	–.17***	.73***	.29***	–	
7. JR-task	.38	.85	–.04	.14**	–.18***	.57***	.22***	.16***	–
8. WE	3.79	1.16	.07*	.05	–.19***	.32***	.24***	.22***	.18***

Note. WE=Work engagement; JR-total=Total job resources factor; JR-manager=Job resources subfactor manager behavior; JR-peer=Job resources subfactor peer behavior; JR-task=Task-related resources subfactor.
[a]Sex is coded as 0=*male*, 1=*female*.
*p<.05; **p<.01; ***p<.001 (two-tailed).

Table 3. Means, standard deviations, and bivariate correlations of study variables at group level (N=103)

Variables	*M*	*SD*	1	2	3	4	5	6	7	8	9
Group-level											
1. Group size	11.83	6.88	–								
Means											
2. JR-total	.32	.38	–.14	–							
3. JR-manager	.16	.42	–.11	.73***	–						
4. JR-peer	.18	.40	–.07	.60***	.15	–					
5. JR-task	.40	.47	–.08	.55***	.14	.01	–				
6. WE	3.80	.44	–.06	.04	.12	–.03	–.07	–			
Variability											
7. JR-total	.82	.22	.05	–.32**	–.19	–.29**	–.13	.17	–		
8. JR-manager	.88	.27	.13	–.40***	–.66***	.05	–.07	–.03	.47***	–	
9. JR-peer	.84	.28	.00	–.21*	–.05	–.35***	.01	.17	.63***	.13	–
10. JR-task	.73	.21	.19	–.22*	.06	–.25*	–.31**	.22*	.13	–.04	.04

Note. WE=Work engagement; JR-total=Total job resources factor; JR-manager=Job resources subfactor manager behavior; JR-peer=Job resources subfactor peer behavior; JR-task=Task-related resources subfactor.
*p<.05; **p<.01; ***p<.001 (two-tailed).

.38, .51, and .73 for manager behavior, peer behavior, and task-related resources, respectively, indicating a low reliability of the group mean for manager behavior, a moderate reliability for peer behavior, and a good reliability of the group mean for task-related resources. Finally, the mean within-group agreement coefficients $r_{WG(J)}$ for manager behavior, peer behavior, and task-related resources were .93 (range=.81-.98), .82 (range=.00-.98), and .90 (range=.65-.98), respectively. In summary, these results seem to support the aggregation of individual-level job resources to the work group level, forming a contextual group-level job resource construct[25]. Therefore, concerning the supposed influence of the work group context on individual job resources subfactors, *Hypothesis 1b* was supported.

Total job resources factor (H2a+c)

Hypothesis 2a stated that group-level job resources have an additionally positive effect on individual work engagement over and above individual-level job resources. To test for this presumed cross-level main effect of group-level job resources, multilevel analyses were conducted following the procedure explained in the method section. Table 4 shows all the steps of model specification. All control variables that did not contribute to the prediction of work engagement were omitted from the models in Step 2 for the individual-level covariates education (unstandardized parameter estimate $\gamma = -0.02$,

Table 4. Multilevel analysis examining overall group-level job resources, group-level job resources variability, and their interaction (dependent variable: individual work engagement)

	Step 1		Step 2		Step 3		Step 4		Step 5	
Variable	PE[a] (*SE*)	*t*	PE[a] (*SE*)	*t*	PE[a] (*SE*)	*t*	PE[a] (*SE*)	*t*	PE[a] (*SE*)	*t*
Fixed effects										
Intercept	3.80 (.04)	90.97***	3.81 (.04)	86.86***	3.81 (.04)	86.93***	3.81 (.04)	86.42***	3.85 (.05)	83.04***
Sex			0.17 (.08)	1.66*	0.17 (.08)	1.98*	0.17 (.09)	1.98*	0.17 (.08)	2.01*
Age			0.01 (.00)	3.94***	0.01 (.00)	3.94***	0.01 (.00)	3.94***	0.01 (.00)	3.93***
Individual job demands			–0.12 (.04)	–2.83**	–0.12 (.04)	–2.82**	–0.12 (.04)	–2.83**	–0.12 (.04)	–2.81**
Individual job resources			0.44 (.04)	10.57***	0.44 (.04)	10.57***	0.44 (.04)	10.57***	0.44 (.04)	10.60***
Group job resources (GJR)					–0.30 (.13)	–2.32*	–0.26 (.14)	–1.92†	–0.19 (.14)	–1.41
Group job resources variability (GJRV)							0.20 (.23)	0.88	0.23 (.23)	0.99
GJR x GJRV									1.69 (.70)	2.43*
Random effects (variance)										
τ_{00} (group)	0.057		0.078		0.078		0.079		0.073	
σ^2 (residual)	1.280		1.100		1.100		1.100		1.099	
Model fit parameters										
AIC	3696.26		3237.01		3240.01		3240.28		3235.34	
BIC	3711.49		3271.82		3279.79		3285.02		3285.04	
–2*logLikelihood	3690.26		3223.01		3224.01		3222.28		3215.34	
Pseudo-R^2 with Nagelkerke adjustment	0%		38.48%		38.57%		38.76%		39.12%	

Note. AIC=Akaike information criterion; BIC=Bayesian information criterion; –2*logLikelihood=deviance. AIC, BIC, –2*logLikelihood: Smaller values indicate better model fit.

[a]PE=Parameter estimate (unstandardized coefficients).

*p<.05; **p<.01; ***p<.001 (two-tailed).

p=.67) and job tenure (γ=0.00, p=.96) and in Step 3 for the group-level covariate group size (γ= − 0.00, p=.71). However, as Table 4 indicates, there was a significant relationship between sex, age, and work engagement. Women (γ=0.17, $p < .05$) and older employees (γ=0.01, $p < .001$) indicated higher levels of work engagement. Furthermore, individual job demands negatively relate with work engagement (γ= − 0.12, $p < .01$) and individual job resources positively relate (γ=0.44, $p < .001$) (see Step 2 in Table 4). With regard to the cross-level main effect predicted in Hypothesis 2a, the results indicate an unexpectedly negative effect of group-level job resources on individual work engagement (γ= − 0.30, $p < .05$) over and above individual job resources (see Step 3 in Table 4). Hypothesis 2c stated that the cross-level relationship should sustain even when possible competing effects of and interaction with the variability of job resources within groups are added to the model. The results show that the negative relationship remains marginally significant when group-level variability of job resources is controlled for (see Step 4 in Table 4). Therefore, group-level job resources had an opposite relationship to work engagement compared with individual-level job resources. This result was further validated. Step 5 in Table 4 indicates that group-level job resources interact with their variability within groups (γ=1.69, $p < .05$), indicating that the cross-level relationship of group-level job resources and work engagement is dependent on the variability within groups. In case of such a significant interaction effect, Cole et al.[19] recommend to test for curvilinear effects of group-level job resources and their variability. Results however indicate no curvilinear relationships with work engagement, whereupon a significant interaction effect can be interpreted. Fig. 1 shows the interaction of group-level job resources and their variability. It seems as if the combination of high group-level job resources with low variability is associated with low work engagement. We further tested for random slopes in the individual-level relationships specified in the model described above. The results indicate that the random-slopes model does not suit the data better than the random intercept-fixed slope models ($\Delta\chi^2_{(1)}$=3.15, p=.21). Therefore, the relationship between individual job resources and work engagement did not significantly vary between groups. Additionally, we calculated the likelihood ratio-based pseudo R^2 with Nagelkerke adjustments to obtain an estimate for variance explanation in work engagement[28]. The final and best-fitting model consequently explains 39% of the variance in work engagement (see Step 5 in Table 4). To summarize, with regard to the analyses conducted with the group-level job resources total factor, *Hypotheses 2a* and therefore *2c* were not supported.

Three job resources subfactors (H2b+c)

The analyses for the job resources subfactors were conducted according to the same procedure described above. The results are presented in Table 5. Again, the control variables that did not contribute to the prediction of work engagement were omitted from the models: education, γ = − 0.02, p=.64 and job tenure, γ = − 0.00, p=.80 both in Step 2 and group size, γ= − 0.00, p=.70 in Step 3. All three individual job resources subfactors were significantly positively associated with individual work engagement (see Step 2 in Table 5). With regard to the group-level job resources subfactors, the picture looks slightly different than in the analyses with the total job resources factor. As Step 3 in Table 5 indicates, only the two subfactors, peer behavior (γ= − 0.24, $p < .05$) and task-related job resources (γ= − 0.38, $p < .001$), yield negative relationships with work engagement, whereas manager behavior is not associated with engagement (γ=0.10, p=.41). We further tested for random slopes in the individual-level relationships of the three job resources subfactors and work engagement. The results again indicate that the random-slope models do not suit the data better than the random intercept-fixed slope models (manager behavior: $\Delta\chi^2_{(2)}$=1.03, p=.60; peer behavior: $\Delta\chi^2_{(2)}$=3.79, p=.15; task-related resources: $\Delta\chi^2_{(2)}$=2.92, p=.23). Therefore, the relationship between individual job resources subfactors and work engagement did not significantly vary between the groups. According to Hypothesis 2c, we further controlled for the corresponding variability in job resources subfactors within groups, as recommended by Cole et al.[19]. Only task-related resources remain a significant negative predictor of work engagement. Moreover, variability of task-related resources itself positively predicts work engagement (γ=0.67, $p < .01$) (see Step 4 in Table 5). Thus, the lower the group-level task-related resources and the higher their variance within groups, the higher employees' work engagement is. According to Hypothesis 2c we further tested for possible interactions of group means and variability within groups and found no effects (see Step 5 in Table 5). The final model therefore explains 40% of the variance in work engagement. Compared with the model including only individual-level variables (Step 2), the final model explains 1% more variance in individual work engagement. To summarize, the results of the analyses conducted with the job resources subfactors confirm the negative relationship of group-level job resources but are limited to the subfactor of task-related resources. Furthermore, the interaction effect yielded in the analyses with the total job resources factor did not appear when using the subfactors. Instead, results indicate that, above all, group-level task-related resources and their variability explain variance in individual work engagement over and above individual job resources. Therefore, on the basis of the results of the analyses conducted with the subfactors of group-level job resources, *Hypothesis 2b* and therefore *2c* were not supported.

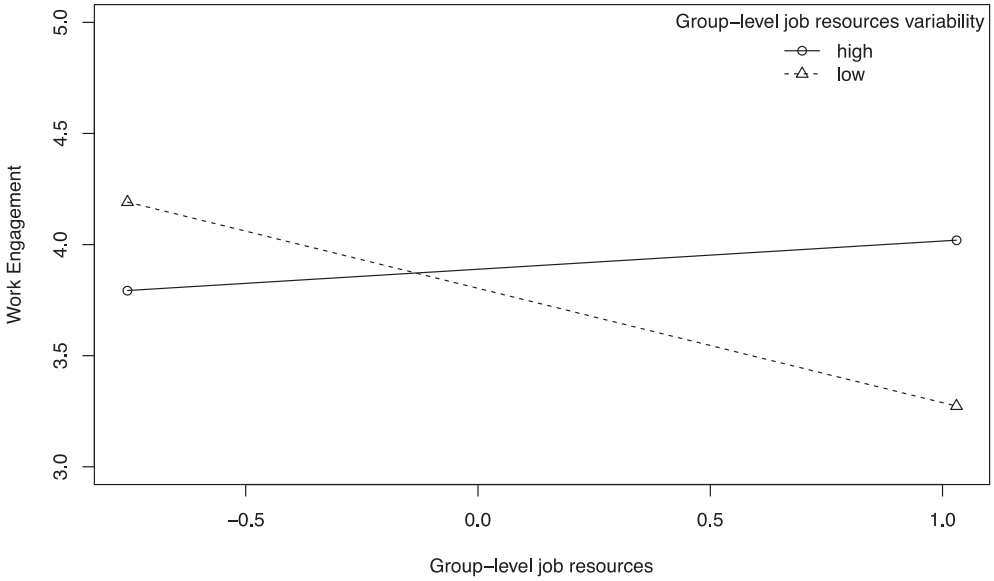

Fig. 1. Work engagement as a function of group-level job resources and their variability within groups.

Post-hoc analyses

Because of the unexpected negative relationships found, we conducted three kinds of supplementary analyses to ensure that collinearity did not influence the results and inferences drawn by the multilevel analyses. A detailed report of the post-hoc analyses is omitted with regard to space restrictions and can be obtained from the corresponding author. Overall, post-hoc analyses indicate that multicollinearity does not pose a problem in the analyses.

Discussion

A recent overview of the state of the art of the JD-R model encouraged the integration of multilevel thinking into it[29]. This study followed the call by investigating the following: first, whether and to what extent job resources cluster within work groups and second, whether it is additionally beneficial for employee engagement if they work in a resource-rich psychosocial work group environment, i.e., where co-workers experience on average high job resources.

The results supported the first hypothesis, as group membership indeed accounted for 7% of the variance in individual job resources, which represents a small to medium effect[24]. As stated in the introduction, this is reasonable because employees in a group share variance in individual job resources because of their group membership and therefore shared psychosocial context factors or group characteristics such as similar work tasks, common supervisors and colleagues, and a group climate. With regard to the three job resources subfactors, group membership yielded a small to medium effect on manager and peer behavior (5% and 8%, respectively) and a medium to large effect (19%) on task-related resources. These values are comparable to those found in the literature on work characteristics and well-being[17,18,30-32]. Studies reporting higher ICC(1) values used a different approach in operationalizing group-level constructs. For example, constructs have a different meaning if they directly refer to the overall level of support within the team, i.e., team support, which has been performed in a study by Vera et al.[17], or whether individually perceived support is aggregated to a mean level of support in teams, which is the case in this study. Moreover, it seems as if the task-related resources clustered more. An explanation for this pattern could be found in the nature of medium- and large-sized organizations that participated in this study. Medium- and large-sized organizations are more likely to have work groups with similar job tasks (in structural terms) clustered in these. Moreover, the more personal job resources, such as manager and peer behavior, are more likely to individually vary as relationships are more affected by individual characteristics than more structural aspects of the work characteristics, such as job control and task identity.

The results of the study did not support the second hypothesis: Although group-level job resources had a significant cross-level relationship with work engagement over and above individual-level job resources, the relationship was in the opposite direction than assumed. In addition, the amount of variance explained in work engagement at group level was very small, particularly when compared with the variance explained by individual job resources. Moreover, the interaction with job resources variability at group level indicates that the combi-

Table 5. Multilevel analysis examining group-level job resources subfactors, group-level job resources subfactors variability, and their interactions (dependent variable: individual work engagement)

	Step 1		Step 2		Step 3		Step 4		Step 5	
Variable	PE[a] (*SE*)	*t*	PE[a] (*SE*)	*t*	PE[a] (*SE*)	*t*	PE[a] (*SE*)	*t*	PE[a] (*SE*)	*t*
Fixed effects										
Intercept	3.80 (.04)	90.97***	3.81 (.04)	87.51***	3.80 (.04)	89.81***	3.81 (.04)	91.63***	3.78 (.05)	71.67***
Sex			0.16 (.08)	1.89†	0.16 (.09)	1.89†	0.16 (.08)	1.90†	0.16 (.08)	1.89†
Age			0.01 (.00)	3.50***	0.01 (.00)	3.50***	0.01 (.00)	3.53***	0.01 (.00)	3.55***
Individual job demands			–0.12 (.04)	–2.90**	–0.12 (.04)	–2.88**	–0.12 (.04)	–2.89**	–0.12 (.04)	–2.90**
Individual JR-manager			0.17 (.04)	4.23***	0.17 (.04)	4.24***	0.17 (.04)	4.25***	0.17 (.04)	4.25***
Individual JR-peer			0.22 (.04)	5.27***	0.22 (.04)	5.25***	0.22 (.04)	5.24***	0.21 (.04)	5.23***
Individual JR-task			0.26 (.05)	5.71***	0.26 (.05)	5.68***	0.26 (.05)	5.64***	0.26 (.05)	5.64***
Group JR-manager (GJRM)					0.10 (.12)	0.83	0.07 (.16)	.42	0.05 (.16)	0.33
Group JR-peer (GJRP)					–0.24 (.12)	–2.00*	–0.14 (.13)	–1.03	–0.13 (.13)	–1.00
Group JR-task (GJRT)					–0.38 (.11)	–3.56***	–0.29 (.11)	–2.68**	–0.33 (.11)	–2.93**
Group variability JR-manager (GVJRM)							0.03 (.23)	0.11	0.05 (.23)	0.21
Group variability JR-peer (GVJRP)							0.16 (.18)	0.38	0.16 (.18)	0.88
Group variability JR-task (GVJRT)							0.67 (.25)	2.71**	0.69 (.25)	2.76**
GJRM×GVJRM									0.04 (.42)	0.10
GJRP×GVJRP									–0.39 (.41)	–0.95
GJRT×GVJRT									–0.69 (.51)	–1.35
Random effects (variance)										
τ_{00} (group)	0.057		0.076		0.066		0.060		0.062	
σ^2 (residual)	1.280		1.096		1.098		1.098		1.096	
Model fit parameters										
AIC	3696.26		3242.89		3250.85		3250.29		3252.90	
BIC	3711.49		3287.63		3310.47		3324.77		3342.22	
–2*logLikelihood	3690.26		3224.89		3226.85		3220.29		3216.90	
Pseudo-R^2 with Nagelkerke adjustment	0%		38.92%		39.28%		39.93%		40.09%	

Note. JR-manager=Job resource subfactor manager behavior; JR-peer=Job resource subfactor peer behavior; JR-task=Task-related resource subfactor; AIC=Akaike information criterion; BIC=Bayesian information criterion; –2*logLikelihood=deviance. AIC, BIC, –2*logLikelihood: Smaller values indicate better model fit.
[a]PE=Parameter estimate (unstandardized coefficients).
†$p<.10$; *$p<.05$; **$p<.01$; ***$p<.001$ (two-tailed).

nation of overall high group-level job resources and a low dispersion within the group is not favorable for employee engagement either. The results for the three subfactors of group-level job resources yield a more detailed picture. When controlled for the variability at group level, only task-related resources (comprised of job control and task identity) are significantly negatively related to work engagement. Furthermore, the analyses indicate that the dispersion of task-related resources within work groups plays a role because a positive cross-level main effect was found on work engagement. To conclude, it seems not only not additionally favorable but even detrimental for employees' work engagement, first, if their work group colleagues on average perceive high job control and task identity and second, when there is a small dispersion in these perceptions, i.e., work group members perceive their task-related resources very similarly. This negative relationship is unexpected and contrary to the positive cross-level relationship reported in one study where team coworker and manager support were positively related to individual work engagement[17]. That study, however, was based on a more narrow study population of nursing teams in one hospital. Nursing teams are supposedly more cohesive and interdependent than the more diverse work groups from different sectors in the present study. Moreover, the nursing team study used a different operationalization of team job resources, referring to all team members in general and not to the individuals. Furthermore, the study of Vera et al. only focused on social team resources, which in our case with the subfactors peer and manager behavior did not yield a significant (negative) relationship with work engagement. To summarize, the nursing teams study did not examine the same research question as this study; Vera et al. were not interested in mean levels of job resources and their effect on work engagement over and above individual job resources because they did not include the individual support variables into their analyses as well. In summary, because the results of the present study do not support the initial hypotheses and because there are not sufficient studies on the topic to provide a clear picture, future research is required to further explore the unexpected relationships found in this study.

If this result pattern is replicated in future studies, alternative explanations should be investigated. We suggest some ideas and directions about possible alternative explanatory approaches, which could be explored in future studies to shed light on these somewhat counterintuitive results. Considering the observed change in the direction of the relationships between engagement and individual- and group-level job resources, our assumption — of whether one can consider group-level job resources as a proxy for a resource-rich work group environment — is called into question. Bliese offers an alternative approach in describing the fuzzy composition model and associated emergent processes and effects at group level, implying that the aggregate variable at group level and the lower-level variable have a (slightly) different meaning[25]. As a result, the aggregate-level variables often tap more or rather other constructs than the individual-level variables so that the aggregated variable contains a higher level of contextual influences not captured by the individual-level construct[25,33]. Consequently, Bliese[25] states that by applying fuzzy composition processes, "analyses involving higher-level constructs are likely to reveal relationships that differ from those at lower levels" (p. 371). In line with this reasoning, it has, for example, been suggested "that a supportive team atmosphere is a clear resource at the individual level but at the team level it can represent a factor that restricts individual freedom. In this way, the same construct could have different functions at different levels of analysis"[29] (p. 5). The finding of a negative cross-level relationship of group-level job resources and engagement thus supports the notion of change in the meaning of constructs across levels[4].

Following this line of thought, we can speculate about what factors may manifest in the group-level job resources construct, particularly in the task-related resources subfactor, which may explain the unexpected negative relationship with work engagement. Work groups with high levels of task-related resources are characterized by employees having high job control and task identity, which means they can perform their tasks in an independent and autonomous way. When we disregard the group context, this situation enhances the engagement of the individual. However, taking into account the work group context and its influence, this situation leads to a picture of a work group of lone fighters, where people do not need to coordinate and interact a lot to fulfill their tasks. From an employee's perspective, working in a group of lone fighters with low task interdependence and no common goals is rather demotivating and engagement derogating[34].

Another explanation could be found in social comparisons within teams. Employees compare themselves and their available resources with their colleagues as standards of reference[35]. People are intrinsically motivated to gain and increase their resources[36]. Therefore, in comparing themselves with their co-workers in their immediate work context, employees may well consider their prospects of gaining resources. Consequently, we assume that employees working in groups with high group-level job resources and low dispersion of job resources could perceive that there is not that much room for improvement left. In contrast, employees working in groups with lower group-level job resources on average combined with high dispersion could perceive a potential for improvement that is worth aspiring for. Social comparisons, particularly their results, influence many outcomes such as one's self-concept, aspiration level, and subjective well-being[37].

Study limitations and directions for future research

Some limitations of this study should be acknowledged. First of all, we can only speculate about the nature of group characteristics, underlying group processes, or context factors that could manifest in the construct of group-level job resources. According to Bliese and colleagues, shared group characteristics, such as cohesion, and/or clustering of individual attributes by work groups, such as intelligence, could influence individual reports of engagement and consequently their group averages[38]. Thus, future research should include specific group constructs, such as the need for cooperation and communication, and group cohesion or collective control to gain further insight into the emergent meaning of job resources at group level. Moreover, it would be interesting to examine whether the relative position of an individual's job resources within a group has an effect on his/her work engagement in the sense of a singled out or frog pond hypothesis. Another limitation relates to the weakness of single item measures, which we used to assess appreciation from colleagues and supervisors, social support from the supervisor, and task identity. However, as we have a theoretically grounded selection of measures and structure because we subsequently built factor scores of job resources, which was supported by exploratory and confirmatory factor analyses, we partly counter the potential drawback of single-item measures. A third limitation concerns the cross-sectional design of the current study, which does not allow us to draw causal relationships between the study variables. Thus, longitudinal research and cross-lagged designs would be useful to examine causal relationships between group-level job resources and work engagement. A final limitation of the present study relates to the restriction to two-level models. Although our data had more than two hierarchical levels, the limitations of the study sample of six organizations precluded the integration of a third level of the organization itself.

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